

Ambient Sediment Toxicity Assessment

Ambient sediment toxicity samples will only be collected in areas where other data indicate that there is likely to be a concern. Routine sediment toxicity sampling will not be conducted. Assessments of ambient toxicity in sediments will look at the spatial and temporal relationship between pollutants and observed toxicity. Evidence for the presence of toxicity will be considered stronger in areas where elevated levels of pollutants coincide with observed toxicity.

Weight of Evidence

The framework by which ambient sediments are to be assessed is considered a weight of evidence approach. This is commonly defined as a determination related to possible ecological impacts based upon multiple lines of evidence. This determination incorporates judgements concerning the quality, extent and congruence of the data contained in the different lines of evidence (Chapman *et al.* 2002).

The lines of evidence to be considered for assessing ambient sediment toxicity will include: whole sediment toxicity test results, elutriate toxicity test results, biological community data, contaminant level data, and best professional judgement (BPJ). In most cases the strongest lines of evidence will be represented by data from whole sediment toxicity tests. Less weight will be given to elutriate, biological and pollutant data. BPJ will be considered the weakest line of evidence and will provide insight to aspects of the other lines of evidence.

This is illustrated in the following example: A waterbody will likely be considered impaired or a concern for ambient sediment toxicity if whole sediment tests indicate a problem even if the four other lines of evidence indicate no chemical or biological impairment. On the other hand, a waterbody may or may not be listed as an impairment or concern if whole sediment toxicity data indicate no adverse effects, but some of the other four lines of evidence demonstrate a problem.

Best Professional Judgement

BPJ comprises the use of expert opinion and judgement based on available data and site-situation specific conditions to determine, for example, environmental status or risk. BPJ can be initiated in cases where there are extensive data but few uncertainties, and in cases where there are few data and many uncertainties (Chapman *et al.* 2002).

For the assessment of ambient toxicity in sediment BPJ will support other lines of evidence to provide final determinations of use support. In many cases BPJ will provide insight to site specific conditions, biological assessment methodologies, toxicological test conditions and pollutant analyses.

Whole Sediment Toxicity Tests

Whole sediment toxicity tests should provide the most useful information for assessing ambient toxicity for the following reasons:

1. Test organisms used are endemic to benthic habitats
2. Test conditions best represent ambient conditions

Considerations

- Temporal and spatial distribution of the samples.
- Porewater samples - Do these indicate elevated levels of pollutants?
- Methods used including modifications to standard protocols.
- Confounding affects of other constituents - AVS, TOC, grain size
- Adverse conditions during the test (presence predatory organisms, high ammonia levels).
- Whole sediment toxicity tests with a chronic duration should be 28 days
- Samples results could be inconclusive which would provide a no available data result.

Evidence of Toxicity:

The evidence of toxicity will depend upon the duration of the test used and the toxicological endpoint (Table 1):

- Evidence which is considered stronger will require more than 10% of the samples to be toxic before a use can be considered impaired (based on the binomial approach).
- Evidence which is considered weaker will generally require more than 50% of the samples to be toxic before a use can be considered impaired (based upon the binomial approach).

Table 1: Strength of evidence of toxicity for whole sediment toxicity tests

		Endpoint	
		Lethal	Sublethal
Test Duration	Acute	Stronger	Weaker
	Chronic	Stronger	Stronger

Elutriate Toxicity Tests

Results of these tests should be considered a weaker line of evidence when evaluating ambient sediment toxicity. The following aspects should be considered when using elutriate tests to evaluate ambient toxicity:

1. These tests were developed to evaluate the effects of dredge disposal on aquatic

organisms. Sediment used in this method is prepared in a way which is not representative of ambient conditions (samples are often shaken for 24 hours). However, these tests may represent conditions experienced under high flow events where substantial amounts of sediment resuspension may occur.

2. These tests are conducted on water column organisms and may or may not indicate effects to actual benthic organisms.

Considerations

- Test organisms used in the tests.
- Methods used including modifications to standard protocols.
- Temporal and spatial distributions of the tests.
- Confounding affects of other constituents - AVS, TOC, grain size.
- Chronic toxicity should not be assessed. Elutriate sediment tests with a chronic duration are 7 to 10 days.
- Samples results could be inconclusive which would provide a no available data result.

Evidence of Toxicity:

The evidence of toxicity will depend upon the duration of the test used and the toxicological endpoint (Table 2):

- Evidence which is considered stronger will require more than 10% of the samples to be toxic before a use can be considered impaired (based on the binomial approach).
- Evidence which is considered weaker will generally require more than 50% of the samples to be toxic before a use can be considered impaired based upon the binomial approach.

Table 2: Strength of evidence of toxicity for elutriate toxicity tests

		Endpoint	
		Lethal	Sublethal
Test Duration	Acute	Stronger	Weaker
	Chronic	Weaker	Weaker

Pollutant Concentrations

Level of pollutants in the sediment can be used in support of observed ambient toxicity. A Toxicity Identification Evaluation is necessary to identify a specific pollutant for load reduction (regulatory activity).

Considerations

- Screening levels used - PEC, PELs, ERM, ERL, etc.
- Temporal and spatial distribution of the samples.
- Confounding affects of other constituents - AVS, TOC, grain size.

- Relative ranking to other similar water bodies throughout the state.
- Samples results could be inconclusive which would provide a no available data result.

Biological Communities

Biological integrity can be used to evaluate the impacts of ambient toxicity

Considerations

- Communities assessed - nekton or benthos.
- TCEQ's Index of Biotic Integrity, used to evaluate aquatic life use support in wadeable streams, may not be sensitive enough to demonstrate toxicity to sensitive species or life stages.
- Biological integrity assessment methods - are there accepted indices by which to assess biological communities. There are no established methods for estuarine biological integrity.
- Samples results could be inconclusive which would provide a no available data result.

Applicability of Ambient Sediment Toxicity to Intermittent Streams (*without perennial pools*)

In order for ambient sediment toxicity to be relevant, the aquatic community must be exposed and affected. Areas that are evaluated for toxicity should have overlying water and an established benthic community.

Ambient Water Toxicity Assessment

Acute Tests

Acute tests have only a primary endpoint, lethality. Results are applied to all water bodies, including intermittent streams.

Chronic Tests

Chronic tests have primary and secondary endpoints, lethal and sublethal effects, respectively. Chronic tests are applied to perennial streams, perennial pools in intermittent streams, reservoirs, tidal streams and estuaries (not intermittent streams).